2.2: Concepts, Constructs, and Variables

We discussed in Chapter 1 that although research can be exploratory, descriptive, or explanatory, most scientific research tend to be of the explanatory type in that they search for potential explanations of observed natural or social phenomena. Explanations require development of concepts or generalizable properties or characteristics associated with objects, events, or people. While objects such as a person, a firm, or a car are not concepts, their specific characteristics or behavior such as a person's attitude toward immigrants, a firm's capacity for innovation, and a car's weight can be viewed as concepts.

Knowingly or unknowingly, we use different kinds of concepts in our everyday conversations. Some of these concepts have been developed over time through our shared language. Sometimes, we borrow concepts from other disciplines or languages to explain a phenomenon of interest. For instance, the idea of gravitation borrowed from physics can be used in business to describe why people tend to "gravitate" to their preferred shopping destinations. Likewise, the concept of distance can be used to explain the degree of social separation between two otherwise collocated individuals. Sometimes, we create our own concepts to describe a unique characteristic not described in prior research. For instance, technostress is a new concept referring to the mental stress one may face when asked to learn a new technology.

Concepts may also have progressive levels of abstraction. Some concepts such as a person’s weight are precise and objective, while other concepts such as a person’s personality may be more abstract and difficult to visualize. A construct is an abstract concept that is specifically chosen (or “created”) to explain a given phenomenon. A construct may be a simple concept, such as a person’s weight, or a combination of a set of related concepts such as a person’s communication skill, which may consist of several underlying concepts such as the person’s vocabulary, syntax, and spelling. The former instance (weight) is a unidimensional construct, while the latter (communication skill) is a multi-dimensional construct (i.e., it consists of multiple underlying concepts). The distinction between constructs and concepts are clearer in multi-dimensional constructs, where the higher order abstraction is called a construct and the
lower order abstractions are called concepts. However, this distinction tends to blur in the case of unidimensional constructs.

Constructs used for scientific research must have precise and clear definitions that others can use to understand exactly what it means and what it does not mean. For instance, a seemingly simple construct such as income may refer to monthly or annual income, before-tax or after-tax income, and personal or family income, and is therefore neither precise nor clear. There are two types of definitions: dictionary definitions and operational definitions. In the more familiar dictionary definition, a construct is often defined in terms of a synonym. For instance, attitude may be defined as a disposition, a feeling, or an affect, and affect in turn is defined as an attitude. Such definitions of a circular nature are not particularly useful in scientific research for elaborating the meaning and content of that construct. Scientific research requires operational definitions that define constructs in terms of how they will be empirically measured. For instance, the operational definition of a construct such as temperature must specify whether we plan to measure temperature in Celsius, Fahrenheit, or Kelvin scale. A construct such as income should be defined in terms of whether we are interested in monthly or annual income, before-tax or after-tax income, and personal or family income. One can imagine that constructs such as learning, personality, and intelligence can be quite hard to define operationally.

![Diagram of theoretical and empirical planes of research](https://socialsci.libretexts.org/Bookshelves/Social_Work/Book%3A_Social_Science_Research_-_Principles_Methods_and_Pr...)

Figure 2.1. The theoretical and empirical planes of research

A term frequently associated with, and sometimes used interchangeably with, a construct is a variable. Etymologically speaking, a variable is a quantity that can vary (e.g., from low to high, negative to positive, etc.), in contrast to constants that do not vary (i.e., remain constant). However, in scientific research, a variable is a measurable representation of an abstract construct. As abstract entities, constructs are not directly measurable, and hence, we look for proxy measures called variables. For instance, a person’s intelligence is often measured as his or her IQ (intelligence quotient) score, which is an index generated from an analytical and pattern-matching test administered to people. In this case, intelligence is a construct, and IQ score is a variable that measures the intelligence construct. Whether IQ scores truly measures one’s intelligence is anyone’s guess (though many believe that they do), and depending on whether how well it measures intelligence, the IQ score may be a good or a poor measure of the intelligence construct. As shown in Figure 2.1, scientific research proceeds along two planes: a theoretical plane and an empirical plane. Constructs are conceptualized at the theoretical (abstract) plane, while variables are operationalized and measured at the empirical (observational) plane. Thinking like a researcher implies the ability to move back and forth between these two planes.

Depending on their intended use, variables may be classified as independent, dependent, moderating, mediating, or control variables. Variables that explain other variables are called independent variables, those that are explained by...
other variables are dependent variables, those that are explained by independent variables while also explaining dependent variables are mediating variables (or intermediate variables), and those that influence the relationship between independent and dependent variables are called moderating variables. As an example, if we state that higher intelligence causes improved learning among students, then intelligence is an independent variable and learning is a dependent variable. There may be other extraneous variables that are not pertinent to explaining a given dependent variable, but may have some impact on the dependent variable. These variables must be controlled for in a scientific study, and are therefore called control variables.

Figure 2.2. A nomological network of constructs

To understand the differences between these different variable types, consider the example shown in Figure 2.2. If we believe that intelligence influences (or explains) students’ academic achievement, then a measure of intelligence such as an IQ score is an independent variable, while a measure of academic success such as grade point average is a dependent variable. If we believe that the effect of intelligence on academic achievement also depends on the effort invested by the student in the learning process (i.e., between two equally intelligent students, the student who puts in more effort achieves higher academic achievement than one who puts in less effort), then effort becomes a moderating variable. Incidentally, one may also view effort as an independent variable and intelligence as a moderating variable. If academic achievement is viewed as an intermediate step to higher earning potential, then earning potential becomes the dependent variable for the independent variable academic achievement, and academic achievement becomes the mediating variable in the relationship between intelligence and earning potential. Hence, variable are defined as an independent, dependent, moderating, or mediating variable based on their nature of association with each other. The overall network of relationships between a set of related constructs is called a nomological network (see Figure 2.2). Thinking like a researcher requires not only being able to abstract constructs from observations, but also being able to mentally visualize a nomological network linking these abstract constructs.